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USSR METHODS OF COMBATING SEVERE HEMORRHAGE

Prof. L. Persianinov

Severe hemorrhage is often encountered in obstetrics. The loss of blood is very dangerous, since it decreases the circulation through the body and causes hemodynamic disorders due to a drop in arterial and venous pressure. The loss in erythrocytes brings about oxygen hunger of the tissues, hypoxia, and with it acidosis, which affects the central nervous system.

I. P. Pavlov, the discoverer of the autoregulation of blood circulation by neuroreflectors, found that this autoregulation is based on the correlation by reflectors of all parts of the cardiovascular system and of the nervous system. This is the mechanism which connects various links of the entire complex apparatus of blood circulation into one whole. Impulses are continuously sent from the receptors of the circulatory system to the nerve centers and to the heart and blood vessels, toning up their activities.

Academician K. M. Bykov found that the cortex of the large hemispheres of the brain controls the activities of the heart and affects the tonus of the peripheral blood vessels. The organism mobilizes compensatory mechanisms after severe hemorrhages. Stimulated by the cortex, the reactions of the physiological systems are coordinated, helping the organism to adjust itself to the new pathological condition of reduced blood volume. As liquid from the tissues enters into the blood channels, the diameter and capacity of the blood vessels decrease, bringing about adjustment to the new blood pressure level. The blood of the spleen, kidneys, mesenterium, and muscular system, is mobilized; the heart action is adjusted and its rhythm speeds up, the minute volume is changed, etc.

If the blood loss becomes so great that it cannot be compensated for by the organism, the supply of blood and oxygen decreases in the organs and tissues. This oxygen hunger particularly affects the central nervous system and the cortex of the brain. Clinical observations have shown that the cortex can endure anemia for 5 or 6 minutes. Within this time its functions can be completely restored. A restoration of life functions was observed by Prof

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E. A. Asratyan in animal experiments after a 20-minute anemization of the brain. Activities of the lower region of the brain, the medulla oblongata, persisted for a still longer period. Defensive-protective inhibitions arise in the brain cortex during oxygen starvation and there is a release of cortex control of the physiological functions. If oxygen starvation is prolonged, the protective inhibitions cease to function and exhaustion of the brain centers follows; the arterial pressure drops to 50 mm and the functions of the cortex are disrupted.

Authors disagree as to how great a hemorrhage must be to threaten life. Estimates vary between a 30 percent and 70 percent loss of the entire volume of blood in the body. The condition of the patient at the time of hemorrhage and the capacity of his compensatory mechanism are important. Undernourishment, fatigue, chilling, and particularly wounds are aggravating factors.

The clinical picture of hemorrhage is familiar: pallor of the skin and mucous membranes, weakness, dizziness, and ringing in the ears; the pulse is weak, the blood pressure is low and often impossible to read with the sphygmomanometer, until death finally occurs.

Blood transfusion is the generally recognized method of combating hemorrhage. It stops the loss of erythrocytes, increases the blood volume, strengthens the compensatory mechanism, and counteracts shock. The amount of blood transfused varies between 250 ml and one liter and depends upon the condition of the patient. During shock, the transfusion should be repeated and finally applied by the drip method. If the heart activity is very weak, intravenous transfusion may be disastrous because the heart may become overloaded. In such cases, intra-arterial transfusion must be resorted to. A rhythmic forcing of the blood into the arteries stimulates the interoreceptors, increases transmission of impulses to the central nervous system, and tends to raise the reflector regulation of the blood pressure and respiration to a normal level.

According to Asratyan, various substances such as calcium chloride, glucose, etc., assist the brain in enduring oxygen starvation. The chemical irritation produced by calcium chloride, for instance, affects the receptors of the vascular wall. In terminal conditions we introduced, together with the blood, 10 ml of a 10 percent calcium chloride solution. This method gave excellent results.

Prokhorov was successful, in cases of shock of the third and fourth degrees, in stimulating activities of the vascular walls by an intra-arterial transfusion of blood combined with the administration of medicinal substances. The solution used by him consisted of 20-30 ml of 40 percent glucose, 10 ml of 10 percent calcium chloride, 10 ml of 5 percent sodium bromide, 5 ml of 10 percent ascorbic acid, 1 ml of 0.6 percent vitamin B_1, and 30 ml of 33 percent alcohol. He introduced the blood under rhythmically alternating pressures, simulating the normal human pulse.

Arterial transfusion is not meant to be a substitute for intravenous transfusion; it is meant to complement it and to be used whenever venous transfusion is unsuccessful. The time factor is of the utmost importance. Arterial transfusion should be used when the blood pressure drops to 60 mm or less and when death is imminent. The amounts of blood used for intra-arterial transfusion vary from 250 to 500 ml, depending upon the extent of the hemorrhage and the condition of the patient.

To alleviate cases in which respiration has stopped, V. A. Negovskiy and others recommend a single intra-arterial transfusion and application of artificial respiration with the aid of a special apparatus or by the manual method.

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If the hemorrhage is not too extensive and if there is no blood supply on hand, blood substitutes and antishock liquids, such as a 5 percent glucose solution or physiological salt solution, are given. Five hundred ml should be given in a single transfusion or 1-1.5 liters administered if the drip method is used. Transfusions of 500 ml of antishock liquids, with an added 10 ml of a 10 percent solution of calcium chloride, have been found to be very effective when administered intra-arterially. In severe hemorrhages, these liquids can be used alone or in combination with blood. A simultaneous injection of one liter of physiological salt solution or of 500 ml of a 5 percent glucose solution is also advisable. Besides receiving the transfusions, the patient should be kept warm and should be given plenty of food as well as a heart stimulant.

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